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No. 401

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GEOPHYSICS, ASTRONOMY AND SPACE

No. 401

This serial publication contains abstracts of articles from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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I. ASTRONOMY

Abstracts of Scientific Articles

MECHANISM OF FORMATION OF EQUATORIAL CURRENT AT JOVIAN SURFACE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 233, No 1, 1977 pp 60-63

[Article by I. M. Yavorskaya and L. M. Simuni, Space Research Institute and Institute of Socioeconomic Problems, "One Possible Explanation of the Mechanism of Formation of the Equatorial Jet Stream at the Jovian Surface"]

[Abstract] The authors propose an explanation of the mechanism of formation of the equatorial jet stream at the Jovian surface. The explanation is a corollary of the Taylor-Proudman theorem and is tied in to the asymptotic theory of motion of a fluid with low viscosity in a rotating shearing spherical layer. Numerical computations for values of the similarity parameters cited in the paper for Jupiter show that at present only qualitative conclusions can be drawn. But a qualitative analysis shows that there is probably a cylindrical shearing layer which is quite thin and its emergence at the upper boundary causes a sharp change in the velocity of rotation of the apparent surface of the planet. Within the framework of the considered model the banded structure of the Jovian surface at latitudes from ± 10 to $\pm 45^\circ$ can be attributed to the emergence of convective elements at the outer boundary; these have the form of axially symmetric rolls elongated along the axis of rotation in the meridional section. Such a form of the elements, according to the Taylor-Proudman theorem, can arise during rapid rotation and when there is shearing in the convective flow.

[353]

INTERNAL STRUCTURE OF JUPITER

Moscow ASTRONOMICHESKIY ZHURNAL in Russian Vol 54, No 2, 1977 pp 372-377

[Article by N. A. Kozyrev, Main Astronomical Observatory, "Internal Structure of Jupiter"]

[Abstract] The characteristic heat flux emerging from the deep layers of Jupiter indicates the possibility of high temperatures there. Therefore, despite the existing concept of a cold state of the matter of Jupiter, the author examines the possibility of its hot and gaseous state. The density and pressure within the cosmic body can be computed on the basis of the known mass and radius. For Jupiter the compression of the disk and motion of the satellites make it possible to establish the inhomogeneity of its structure and refine the density and pressure at its center. From these data, on the assumption of a hot interior, when the internal pressure is dependent on the energy of thermal motion, the author has computed the temperature, taking into account the degeneration of gas and the electrostatic interaction among particles. The temperature at the center was 165,000°K. Such a temperature leads to a heat flux from the Jovian surface whose value is close to that actually registered during flights of the stations "Pioneer 10" and "Pioneer 11." This completely independent check confirms the correctness of the model of a hot Jupiter and confirms its similarity to stars.

[74]

CONDITIONS FOR ABSENCE OF COLLISIONS IN THREE-BODY PROBLEM

Moscow ASTRONOMICHSKIY ZHURNAL in Russian Vol 54, No 2, 1977 pp 425-428

[Article by N. I. Gavrilov, Odessa State University, "Adequate Conditions for Absence of Collisions in Three-Body Problem"]

[Abstract] The classical problem of collisions in the three-body problem is to indicate such restrictions on the initial conditions under which during the time of motion there will be collisions of the bodies -- both paired and triple. This problem is one of the most difficult in celestial mechanics and has not yet been solved. In the absence of simultaneous collision of all three bodies an adequate condition is known: during the motion of three bodies there is conservation of the moment of momentum relative to the center of gravity of these bodies or there are three area integrals. Each such integral has a constant value along the solution. It has been postulated and rigorously demonstrated that in the case of triple collision of bodies all the constant areas become equal to zero. This means that if the initial conditions are such that at least one of the constant areas is different from zero, with corresponding motion of the three bodies a triple collision is impossible. For the absence of a double collision this kind of condition has not been found and thus the problem of absence of collisions has not yet been solved. Not even an approach to its solution has been found. Using the theorems (I and II) published earlier by the author ("On One Poincaré Problem in Celestial Mechanics," ASTRON. ZH., 54, 206, 1977) it follows that adequate conditions can be ascertained for the absence of collisions.

[74]

OPTICAL PARAMETERS OF MARTIAN ATMOSPHERE AND SURFACE

Moscow ASTRONOMICHSKIY VESTNIK in Russian Vol XI, No 2, 1977 pp 85-89

[Article by A. V. Morozhenko, Main Astronomical Observatory Ukrainian Academy of Sciences, "Optical Parameters of Martian Atmosphere and Surface. IV. Physical Properties of Dust Clouds and Mean Radius of Particles of Surface Layer of the Continent Arabia"]

[Abstract] An analysis of the polarization and photometric measurements of Mars during the period of global dust storms made it possible to determine the spectral values of the complex refractive index ($n_r = 1.59 \pm 0.01$ and $n_i = (3.8-0.5) \cdot 10^4$ for $0.5 \leq \lambda \leq 1.1 \mu\text{m}$ for the mean geometric radius of particles ($r_0 \approx 10 \mu\text{m}$) and also the number of particles with a mean radius of $10 \mu\text{m}$ in a column of the atmosphere $10^6 \leq N \leq 10^7 \text{ cm}^{-2}$. The r_0 and N values relate to the time of the maximum density of the dust cloud on Mars in 1971. In addition, determination of the complex refractive index of dust particles made it possible to obtain confirmation of the hypothesis of a silicate nature of the clouds and also to estimate the mean radius of the particles in the surface layer of the continent Arabia ($70-100 \mu\text{m}$).

[105]

SHORT-PERIOD FLUCTUATIONS IN SOLAR RADIOEMISSION

Moscow PIS'MA V ASTRONOMICHSKIY ZHURNAL in Russian Vol 3, No 5, 1977 pp 229-231

[Article by V. V. Pakhomov and S. D. Snegirev, Radiophysics Scientific Research Institute, Gor'kiy, "Short-Period Fluctuations in Decimeter Solar Radioemission"]

[Abstract] For clarifying the matter of the presence of fluctuations with periods of about one minute in solar decimeter radioemission the authors have reprocessed the results of observations made earlier at wavelengths 60 and 30 cm by other authors. The observations were made using a radiotelescope with a parabolic dish with a diameter of 7.5 m (Pustyn' station) and a radiometer at $\lambda = 30 \text{ cm}$ with a fluctuation response threshold $\delta T = 0.5^\circ$ with $\tau = 1 \text{ sec}$ and with a band width $\Delta f = 40 \text{ MHz}$. Reception of solar radioemission was by the quasiray method with an integration time constant 15 sec. The records were obtained during the period from 1 July through 10 August 1973 when there was weak solar activity. Hour intervals of records free of bursts were processed for finding quasiperiodic components with periods of about one minute. The decimeter solar radioemission was found to contain quasiperiodic components of fluctuations with periods of about one minute. There was a predominance of fluctuations with periods of 60-90 and 40-50 sec. A hypothesis concerning the lifetime of the investigated components is expressed.

[100]

INVESTIGATION OF CH₄ ABSORPTION BANDS IN URANIAN SPECTRUM

Moscow ASTRONOMICHESKIY VESTNIK in Russian Vol XI, No 2, 1977 pp 90-93

[Article by A. A. Atai and N. B. Ibragimov, Shemakhinskaya Astrophysical Observatory, "Investigation of CH₄ Absorption Bands in Uranian Spectrum"]

[Abstract] On the basis of spectrograms of Uranus obtained using the 2-m reflector of the Shemakhinskaya Astrophysical Observatory of the Azerbaydzhan Academy of Sciences in March-May 1970 with a dispersion of 6 Å/mm the authors investigated the CH₄ absorption bands 5430, 5570, 5760, 5970 and 6190 Å and determined some optical parameters (σ_a , τ_v , λ_v , L (CH₄) and others) in the atmosphere of that planet. Using the CH₄ absorption band 6190 Å in a simple reflection model it was possible to find the equivalent path of the ray in the methane band $\alpha(\text{CH}_4) = (1050 \pm 75) - (920 \pm 75)$ m-atm, and in a multiple scattering model the equivalent thickness of methane in the layer of the atmosphere over the clouds on Uranus was equal to $\alpha(\text{CH}_4) = (84 \pm 10) - (74 \pm 10)$ m-atm for $g = 0.75$ and $g = 0.0$.
[105]

STATIC LOAD ON FRAME-TYPE TELESCOPE SUPPORT

Moscow ASTRONOMICHESKIY ZHURNAL in Russian Vol 54, No 2, 1977 pp 440-446

[Article by Ye. V. Sosnovskiy and D. N. Spitsyna, Moscow Higher Technical School, "Investigation of the Support of a Frame-Type Telescope Under a Static Load"]

[Abstract] Investigations of recent years have made it possible to find new sites for installing new telescopes where the atmosphere is calm. But at such sites a role is played by local mechanisms of deterioration of image quality associated with the telescope tower whose influence is less conspicuous at observatories with a less calm atmosphere. The deterioration of image quality is associated with wind flow around the mountain peak as a result of appearance of cold air near the telescope as a result of radiation cooling of the surface of the dome and instrument. These effects are extremely strong and lead to a deterioration of image quality, which reduces to nil the gain expected from installing the telescope in a high tower over the inversion layer. The best solution of the problem is installation of the telescope on a support which offers minimum wind resistance (as illustrated in Fig. 2 in the text and described in detail). In this case there is virtually no reflected air flow. A support of the described type is of interest for solar observations because it makes it possible to put the telescope outside the region of strongest convection. The geometry of such a support for a telescope making it possible to ensure its adequate stability under a wind load was proposed by R. H. Hammerschlag.

The authors of this paper examine some properties of these supports. It is shown that since the wind load acts on the surface of all support components, causing their flexure, the support cannot be considered a beam. The support is a spatial frame with rigid elements. The "movements" method was used in its design. In a general case of loading each rigid element of the frame can have three linear and three angular movements. The authors determined the movements caused both by the static wind load and the movements caused by an observer present on the support. In the computations the following variants of the external diameters of frame pipes were used: 245, 219, 203 and 159 mm. The height of the support was varied in the range from 6 to 15 m. In all variants of the supports the relationship between the height and width of the base was assumed to be about 2:1. The support was assumed to be made of steel and the mean wind velocity was assumed to be 5 m/sec. A series of conclusions is drawn.

[74]

POSSIBILITIES FOR COMMUNICATION WITH EXTRATERRESTRIAL CIVILIZATIONS

Moscow ASTRONOMICHSKIY ZHURNAL in Russian Vol 54, No 2, 1977 pp 449-451

[Article by P. V. Makovetskiy, Leningrad Institute of Aviation Instrument Making, "The Nova Cygni -- A Synchronizing Signal for Extraterrestrial Civilizations?"]

[Abstract] In an earlier article by the author (ASTRON. ZH., 53, 221, 1976) devoted to communication with extraterrestrial civilizations and the nature of the signals which might be used it was demonstrated that four-dimensional information subspace frequency - modulation - code - semantics can be reduced to one or more points on the frequency axis ($\mathfrak{N} f_H, f_H \sqrt{2}, \dots$). In the article cited above the author now demonstrates the possibility of a further reduction of uncertainty in distance - angles - time subspace. The same principle of maximum simplicity (P. V. Makovetskiy, SMOTRI V KOREN'!, third edition, "Nauka," Moscow, p 414, 1976) is used as in the case of information subspace. Proceeding on this basis, it is shown that if extraterrestrial civilizations use the flaring of Nova Cygni (29 August 1975) for synchronization of call signals, it would be possible to detect the signals from Ross 248 since 2 September 1976, from Barnard's star since 15 September 1978, etc. The best chance of successful reception is from the direction of the nova neighborhood and the best chances for successful transmission are in the antipodal direction (Vela).

[74]

ESTIMATE OF INFLUENCE OF RINGS ON GRAVITY FIELD OF SATURN

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 5, 1977 pp 232-234

[Article by A. M. Bobrov, P. P. Vasil'yev and V. P. Trubitsyn, Institute of Physics of the Earth, "Estimate of the Influence of the Rings on the Gravity Field of Saturn"]

[Abstract] The Pioneer 11 spacecraft is now flying toward Saturn; plans call for sending it through the rings or through the region between the rings and the planet. This paper is a study of the gravitational effect of the rings. The authors have computed the contributions to the total field of the system caused by the characteristic field of the rings and their tidal perturbation of the planet. The calculations presented here give the density distribution in the rings determined using optical models. It is shown that with a mass of the rings equal to 10^{-6} the planetary mass the gravitational moments of the rings, beginning with the eighth harmonic, exceed the moments of Saturn.

[100]

II. METEOROLOGY

News

REPORT ON "MONSOON-77" EXPERIMENT

Moscow IZVESTIYA in Russian 14 Jun 77 p 3

[Unsigned article, "'Monsoon-77'"]

[Text] The joint Soviet-Indian scientific experiment "Monsoon-77" is being successfully carried out. At the present time scientists are studying the conditions which cause the southwestern monsoon in the Arabian Sea. Then they will observe its development in other areas of the Indian Ocean. The experiment will be completed in August of this year in the Bay of Bengal area. Productive cooperation between meteorologists of the USSR and India has been going on for more than 15 years. [5]

AUTOMATIC GEOPHYSICAL MEASUREMENT STATION DESIGNED

Moscow IZVESTIYA in Russian 19 Jun 77 p 4

[Article by A. Purtov, "Automatic Geophysicist"]

[Excerpt] Leningrad. The state of the weather is determined up to 30 times a day at meteorological sites in all types of weather and at any time of the year. Then the materials are processed, tables are compiled and perforated tapes are punched. This work is very time consuming. Now all of this is done automatically. The country's first automatic geophysical measurement station has been designed by personnel of the Special Design Bureau of Hydrometeorological Instruments and scientists of the Main Geophysical Observatory.

[5]

Abstracts of Scientific Articles

APPLICATION OF GAS ANALYZERS IN LIDARS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 5, 1977 pp 515-521

[Article by N. V. Vanin, Moscow State University, "Use of Gas Analyzers in Lidars for Atmospheric Sounding"]

[Abstract] The author proposes a method for using a nondispersion gas analyzer (NDGA) mounted in the reception unit of a lidar for the purpose of atmospheric sounding. A study was made of the structural diagram of a lidar with a NDGA. The change in the intensity of laser radiation along the sounding path as a result of absorption by the investigated gas is found. Mathematical processing of the measurement results makes it possible to obtain the density profile of the investigated gas along the sounding path. The author also gives an evaluation of the sensitivity of the method for determining the gas concentration when using a NDGA. It is believed that the NDGA can find extensive use in investigations of the atmosphere by the resonance absorption method. The NDGA can be employed for determining small gas contaminations in the atmosphere. The use of an NDGA in lidars will make it possible to use lasers with a width of the emission line exceeding the width of the absorption line of the investigated gas.

[106]

INTERACTION OF PROCESSES AND THEIR INFLUENCE ON CHANGES IN METEOROLOGICAL PARAMETERS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 5, 1977 pp 443-450

[Article by R. V. Abramov and O. A. Gushchin, Atlantic Division, Institute of Oceanology, "Processes of Different Scale and Their Interaction in the Changes in Meteorological Parameters of the Atmosphere Over the Atlantic"]

[Abstract] The authors used the method of two-factor dispersion analysis for an investigation of two-dimensional series of observations of atmospheric pressure, air temperature, total and lower cloud cover on the basis of shipboard data and also cloud cover on the basis of satellite data obtained over the Atlantic Ocean. An estimate is made of the contribution and significance of processes of different scales on the change in the investigated parameters by a comparison of sample dispersions and the F test. Ideas are expressed concerning the physical nature of the "dispersion of interaction."

[106]

III. OCEANOGRAPHY

News

HYDROPHYSICAL PROPERTIES OF BLACK SEA STUDIED

Moscow PRAVDA in Russian 11 Jun 77 p 6

[Unsigned]

[Text] Scientists of the Black Sea Division of the Ukrainian SSR Academy of Sciences Marine Hydrophysical Institute are studying hydrophysical processes in the Black Sea. They are studying waves, optical phenomena and structure and circulation of Black Sea waters. Processes near the shore are being investigated in an experimental marine polygon and an operational procedure with new apparatus is being developed. [A photograph shows the experimental proceedings.] [5]

Abstracts of Scientific Articles

GEOLOGICAL RESEARCH ON SHELF USING "TINRO-2" UNDERWATER CRAFT

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 3, 1977 pp 145-149

[Article by B. I. Vasil'yev, Sakhalin Multidiscipline Scientific Research Institute, "Method for Geological Investigation of the Shelf Using the 'TINRO-2' Manned Underwater Vehicle"]

[Abstract] The author participated in a series of submergences in the "TINRO-2" underwater vehicle in the Central Atlantic. Qualitatively new information was obtained. The vehicle was designed and constructed at the "Giprorybflot" institute. It is a self-contained two-man vehicle with a maximum submergence depth of 400 m, designed for biological investigations. The vehicle has six windows with a diameter of 140 mm and three with a diameter of 80 mm, ensuring a wide field of view. The work was done in the Azores Archipelago and also on Dasia Bank in the Central Atlantic. Geological research was conducted by means of visual observations and photographing of geological features. The purpose of the observations was a clarification of the conditions for the bedding of rocks and sediments. Prior to submergence there were detailed measurements of depth and samples were taken by dredge. The results of these studies made it possible to lay out the route of the underwater vehicle across the strike of the morpho-structures. Observations were made continuously during movement of the vehicle over the bottom at a distance of 1-3 m with a speed from 0.5 to 2 knots. As an example, the article gives the results of the observations made on Dasia Bank at a distance of 185 miles from Madeira Island. The observations show that Dasia Bank is the peak of an underwater mountain cut by abrasion which subsided below sea level at the end of the Pleistocene. The mountain peak is evidently an abrasional remnant of a basaltic plateau.

[76]

NONLINEAR INTERACTIONS IN FORMATION OF MEAN FIELDS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 5, 1977 pp 537-542

[Article by S. A. Yermakov and Ye. N. Pelinovskiy, Gor'kiy Scientific Research Radiophysics Institute, "Role of Nonlinear Interactions in the Formation of Mean Fields"]

[Abstract] On the basis of equations describing nonlinear wave interactions the authors examine the propagation of a regular wave against the background of random (noise) fields. It was found that the attenuation (intensification) of the mean field is expressed through the spatial-temporal noise spectrum and the coefficients of nonlinear interactions taken for values of the wave numbers and frequencies satisfying the known conditions of wave synchronism. As an example, the article examines the problem of generation of an internal wave in an exponentially stratified ocean by the field of random wind waves.

[106]

IV. TERRESTRIAL GEOPHYSICS

News

TASS REPORTS EARTHQUAKE IN UZBEKISTAN

Moscow PRAVDA in Russian 4 Jun 77 p 6

[TASS Report: "Underground Tremors"]

[Text] Tashkent, 3 June. On 3 June at 0706 hours and at 0832 hours (local time) the inhabitants of the capital of Uzbekistan felt underground tremors which registered forces four and three.

According to data from the seismic station "Tashkent," the first earthquake occurred in the ridges of the Alayskiy Range, approximately 100 kilometers south of the city of Fergana. The force of the tremor at the epicenter reached force seven.

The second underground tremor had approximately the same force (more than force 6) but it was deeper. Instruments registered its epicenter in the territory of Afghanistan approximately 500 km south of Tashkent.

Neither earthquake caused any damage in the territory of Uzbekistan.
[5]

TASS REPORTS EARTHQUAKE IN TADZHIKISTAN

Moscow IZVESTIYA in Russian 4 Jun 77 p 6

[Article by V. Surkov, "Underground Tremors"]

[Text] On the morning of 3 June two earthquakes occurred in Tadzhikistan. The second one, which rattled dishes and caused books to fall from shelves, was especially strong. The tremors were estimated to be force five in Dushanbe, Kulyak, Khorog and Samarkand according to preliminary data. Information about damage and casualties during the tremors has not been received.
[5]

ALL-UNION CONFERENCE ON GAZLI EARTHQUAKES

Yerevan IZVESTIYA AKADEMII NAUK ARMYANSKOY SSR, NAUKI O ZEMLI in Russian
Vol XXX, No 1, 1977 p 105

[Article by I. V. Igumnov, "All-Union Conference on Study of Gazli Earthquakes"]

[Abstract] The Interdepartmental Council on Seismology and Seismic Resistant Construction USSR Academy of Sciences held a conference for discussion of Gazli earthquakes during the period 27-29 October 1976 at the Seismology Institute Uzbek Academy of Sciences. During April-June 1976 the Gazli region was afflicted by several strong earthquakes. Their epicenters were associated with the intersection of the central Tien Shan zone and the central Kyzylkum zone. The earthquake of 8 April with a magnitude of about 7.0 and a focal depth of about 20 km had a focal extent of about 50 km. The earthquake of 17 May with M about 7.3 and a focal depth of about 30 km had a focal extent of about 70 km. All the geochemical indicators for the Gazli earthquakes revealed that in the region of earthquake preparation an enormous area was involved. It was possible to register changes in the contents of gaseous (radon, CO₂, He, H and others) and chemical components of mineral waters several days before an earthquake even at such observation stations at considerable distances from Gazli as Andizhan (700 km) and Obigarm (more than 1,000 km). The conference was held in two sections: geophysical and geological observations, geochemical indicators of earthquakes. A commission on hydroseismological methods for finding earthquake precursors has been established in the Interdepartmental Council on Seismology and Seismic Resistant Construction.

[113]

Abstracts of Scientific Articles

METHOD FOR MEASURING CRUSTAL DEFORMATIONS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.113

[Abstract of article by I. P. Chernobay, O. Ye. Starovoyt and V. I. Danilov; Kiev, VRASHCHENIYE I PRILIVN. DEFORMATSII ZEMLI, No 8, "Nauk. Dumka," 1976, pp 44-47, "Accuracy in Measurements of Deformations of the Earth's Crust Using Rod Deformographs"]

[Text] It is pointed out that the "Obninsk" Central Seismological Observatory has developed and installed a quartz deformometer intended for the registry of elastic deformations arising under the influence of tidal forces and earthquakes. Also considered is the influence of different factors on the accuracy of using this instrument to measure deformations and there is an evaluation of the errors in its calibration by the method of application of a known force to the rod. Bibliography of 18 items.
[78]

CALIBRATION OF GRADIENT METER

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.80

[Abstract of article by O. A. Akimov; Tula, GRAVIMETRICH. PRIBOROSTROYENIYE, 1975, pp 5-8, "Calibration of Response of Low-Frequency Gradient Meter"]

[Text] The response of a gradient meter is determined on the basis of the correlation between the output signal of the sensor and the change in the gradient of the gravitational field. The creation of a gravitational field gradient is accomplished using a calibration mass moving in accordance with a prestipulated law. The article includes a block diagram of gradient meter calibration and also a block diagram of the regulation of frequency regulation and phase regulation of the calibrator. The author demonstrates the

influence of the gravitational field of rotating masses on the test masses of the gradient meter. With a change in some parameters of the device it can be used for the calibration of gradient meters with different frequencies of oscillations of the test bodies.

[78]

PRIMARY PROCESSING OF GRAVIMETRIC DATA FROM PHOTOTAPE

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.74

[Abstract of article by O. N. Polozova and K. P. Voropayeva; Tula, GRAVIMETRICH. PRIBOROSTROYENIYE, 1975, pp 39-42, "Primary Processing of Gravimetric Information from a Phototape"]

[Text] For the routine processing of gravimetric information (from a phototape) the authors propose use of computers and apparatus for the automatic input of data into a digital computer. Also given is a structural diagram of a device for the graphic input of data; it can be of the continuous or discrete action type. A higher measurement accuracy is attained in devices of the discrete action type. Also considered is the method for evaluating the resulting records and an algorithm for compressing the information when processing the tape.

[78]

DEVELOPMENT OF GRAVIMETRIC APPARATUS AT TULA

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.71

[Abstract of article by Ye. G. Voropayev; Tula, GRAVIMETRICH. PRIBOROSTROYENIYE, 1975, pp 3-4, "Development of Gravimetric Apparatus at the Tula Polytechnic Institute"]

[Text] Specialists in the Gravimetric Laboratory at the Tula Polytechnic Institute have developed a series of gravimetric instruments and auxiliary apparatus: TAG-1 automated sea gravimeter (1969); the TGG gravimeter with built-in gyroscopic stabilizer; the PPT-1 (1971) semiconductor current converter (for supplying current to the gyroscopic motors of the gravimeter); GMN-72 gyroscopic stabilizer for an automated gravimeter; MAG-1 sea automated gravimeter (jointly with the State Astronomical Institute, 1972); a gravitational antenna for detecting gravitational waves of extraterrestrial origin (1973-1974). Specialists have developed and fabricated a series of automatic pendulum instruments with telecontrol.

[78]

OBSERVATIONS AT POLTAVA GRAVIMETRIC OBSERVATORY

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.2

[Abstract of article by I. A. Dychko and N. I. Panchenko; Kiev, VRASHCHEN-IYE I PRILIVN. DEFORMATSII ZEMLI, No 8, "Nauk. Dumka," 1976, pp 3-19, "Development of Geophysical and Astronomical Investigations at the Poltava Gravimetric Observatory"]

[Text] This is a brief review of the scientific studies carried out since the day of opening of the observatory (7 April 1926), founded by A. Ya. Orlov. In a historical aspect the authors examine the principal directions in activity of the observatory: study of the earth's gravitational field, earth tides, movements of the earth's poles. The most important of the completed studies are evaluated. Emphasis is on the results obtained during the last 10 years. Bibliography of 123 items.

[78]

SCALING FIELD FROM ARBITRARY SURFACE ONTO SPHERE

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.69

[Abstract of article by A. B. Bondarenko; --, SOOBSHCH. GOS. ASTRON. IN-TA IM. P. K. SHTERNBERGA, No 194, 1976, pp 60-68, "Problem of Scaling an Anomalous Field from an Anomalous Surface onto a Sphere"]

[Text] A method is proposed for scaling gravity anomalies from the physical surface of the earth into external space by means of numerical inversion of the Poisson integral, written in a spherical approximation. The initial information is the mean anomalies of gravity in standard trapezia. The authors made experimental computations on an electronic computer for the region of Australia with use of the mean anomalies in trapezia 10' x 15'.

[78]

COMPUTATION OF NONLINEAR AUTOMATIC CONTROL SYSTEMS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.72

[Abstract of article by E. S. Reshet'ko and Ye. G. Vopopayev; Tula, GRAVIMETRICH. PRIBOROSTROYENIYE, 1975, pp 25-32, "Computation of Nonlinear Automatic Control Systems in the Presence of m Nonlinearities"]

[Text] Gravimetric instruments are regarded as nonlinear automatic control systems. The article describes one of the possibilities of stability of nonlinear systems in the presence of a great number of nonlinearities and gives the criteria for their asymptotic stability. Also considered is a method for determining the criteria for an investigation of the characteristics of an automated gravimeter.
[78]

NEW CLASS OF MEASURING INSTRUMENTS DESCRIBED

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 2, 1977 2.52.73

[Abstract of article by Ye. G. Voropayev and E. S. Reshet'ko; Tula, GRAVIMETRICH. PRIBOROSTROYENIYE, 1975, pp 32-35, "Possibility of Constructing Measurement Systems on the Basis of Shaping a Signal for the Quantity of Information"]

[Text] At the present time the development and use of gravimetric measurement systems are related to an improvement in the dynamic qualities of the instruments and the use of different algorithms for the processing of information. The output coordinate is related to the useful signal Δg and the parameters of motion of the base of the instrument by an expression in which the useful signal is a function of very many variables and with the use of a measuring capacitor its capacitance is a function of many variables as well. The effectiveness of the considered method is dependent on the correctness of choice of the function of the monitored parameter for different gravimeters. Such a choice can be made on the basis of the quantity of information, which is closely associated with the relative error in measurement. By varying the parameters and achieving the maximum of information it is possible to increase the measurement accuracy considerably.
[78]

STUDY OF P-WAVES FROM UST'-KAMCHATSKOYE EARTHQUAKE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 4, 1977 pp 20-34

[Article by A. G. Moskvina, O. A. Korchagin and G. L. Kosarev, Institute of Physics of the Earth, "Study of P-Waves from the Ust'-Kamchatskoye Earthquake of 15 December 1971"]

[Abstract] A study was made of the problem of the form of the true motion of the soil in the group of longitudinal waves during the Ust'-Kamchatskoye earthquake of 15 December 1971. The authors used data registered by SD

long-period instruments set up at stations in the unified seismic station network. It is shown that the P wave has the form of a sign-variable long-period oscillation ($T \sim 40$ sec), complicated by pulsed arrivals. The latter cannot be identified with the reflected pP phases or PcP, and probably indicate that the process at the earthquake focus did not occur smoothly, but in the form of a series of shocks.

[77]

STATISTICAL ALGORITHMS FOR SCALING OF GEOPHYSICAL FIELDS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 4, 1977 pp 35-48

[Article by F. M. Gol'tsman, Leningrad State University, "Statistical Algorithms for Scaling Geophysical Fields"]

[Abstract] On the basis of statistical theory the author proposes a unified method for formulating optimum algorithms of the inverse continuation of wave or potential fields and inverse filtering. It is shown that the problem of reconstructing the seismic field in regions approaching sources can be solved on a practical basis only under the assumption of a regularity of fields. The optimum procedures for inverse continuation are transformed into the presently used algorithms for the construction of seismic cross sections. The investigation is generalized for cases of scaling of potential fields and the inverse filtering of seismic paths.

[77]

INTERRELATIONSHIP OF VARIATIONS OF GEOMAGNETIC FIELD AND EARTH CURRENTS

Moscow DOKLADY AKADEMII NAUK BELORUSSKOY SSR in Russian Vol XXI, No 4, 1977 pp 342-344

[Article by M. S. Babushnikov, Institute of Geochemistry and Geophysics Belorussian Academy of Sciences, "Interrelationship of Disturbed Variations of the Geomagnetic Field and Earth Currents"]

[Abstract] Since 1962 specialists at the Geophysical Observatory at Pleshchentsy have been carrying out observations of the geomagnetic field and earth currents using apparatus with identical scanning of the photorecord 20 and 90 mm/hour. In the geomagnetic field three components were registered: northerly (X), easterly (Y) and vertical (Z), and in earth currents, two components: north-south (NS) and east-west (EW). The simultaneity of observations makes it possible to compare the records of variations of the indicated elements and to draw some conclusions concerning the nature and interrelationship of these phenomena. The most important problem was to determine

which of the components of the electromagnetic field (magnetic or electric) is primary and which is secondary. The data revealed that in earth currents the variations are more mobile and the extrema of the bays and even sudden commencements and bursts in this case outpace those in the geomagnetic field. Accordingly, variations in the geomagnetic field cannot be the cause of these changes in earth currents. It is possible that the ionospheric currents responsible for all the variations simultaneously excite magnetic variations and earth current variations. But the well-conducting underlying surface of the earth reacts rapidly to all fluctuations in the ionosphere, whereas the creation of geomagnetic field variations is associated with the magnetization and demagnetization of the surface and the medium surrounding the earth. Since variations in earth currents are dependent on the underlying surface, for different surface layers there will be different lag or lead times for the extrema in the components of the electromagnetic field.

[75]

V. UPPER ATMOSPHERE AND SPACE RESEARCH

News

ACADEMICIAN PETROV COMMENTS ON US-USSR SPACE AGREEMENT

Moscow PRAVDA in Russian 27 May 77 p 4

[Unsigned article: "For the Conquest of Space"]

[Text] As is well known, on 24 May 1977 a new international agreement entered into force between the Soviet Union and the United States on cooperation in the exploration of space for peaceful purposes. A PRAVDA correspondent turned to the Chairman of the "Interkosmos" council, Academician B. N. Petrov, with a request that he tell how its implementation will be carried out.

"This agreement," stated B. N. Petrov, "provides for the further development of cooperation in scientific and applied fields of cosmonautics between the two countries. In particular, we will continue to carry out joint investigations of circumterrestrial space, the moon and the planets, in the field of space biology and medicine, space meteorology, study of the environment and creation of satellite search-rescue systems."

"The two sides will undertake the necessary measures for further development of cooperation in the field of manned space flights for scientific and practical purposes, including the use of joint means for approach and docking created on the basis of those which were developed in the course of carrying out the Apollo-Soyuz program and tested during the experimental flight of the two spacecraft in July 1975. The combined efforts of the USSR and the United States in this direction constitute a logical continuation of the successful flight of the 'Soyuz' and 'Apollo'."

"Specific work will be carried out on the basis of an agreement between the USSR Academy of Sciences and NASA, signed by the President of the USSR Academy of Sciences Academician A. P. Aleksandrov and Doctor A. Lovelace, presently acting as NASA administrator. There provision is made for the possibility of carrying out joint experimental flights of the Soviet long-lived orbital station of the 'Salyut' type and the American 'Shuttle'."

spaceship ('Salyut'-'Shuttle' program)."

"For this purpose mixed working groups have been established, consisting of Soviet and American specialists who are preparing recommendations on the programs."

"In the course of the joint activity of the groups preliminary proposals will be made on the scientific experiments and technical proposals under each of the programs."

"The experience in activity of 'Interkosmos' shows the fertility of cooperation of different countries in the study and exploitation of space for peaceful purposes. And we hope that the agreement will make it possible to move still further along the road."
[88]

NOTES ON SOVIET COMMUNICATIONS SATELLITES

Moscow IZVESTIYA in Russian 7 May 77 p 5

[Article by V. Belikov: "Space Serves Communications"]

[Excerpt] The names "Molniya," "Orbita" and "Intersputnik" have so entered our everyday vocabulary that it is difficult to remember that only ten years ago they still were not in use. The opening of the "Orbita" remote space radio communication system was in October 1967 and was regarded as a gift of the great body of Soviet scientists and designers, engineers and workers to the fiftieth anniversary of the Great October Revolution.

Today we have a widely branched network of ground space communication stations. At more than 70 points in the country, from Murmansk to Alma-Ata and from Nebit-Dag to Anadyr' it is possible to encounter characteristic "dishes," the antennas of the "Orbita" system. They not only make it possible to receive television programs from Moscow, but also to ensure stable transmission of a great many telephone conversations, telegrams and teletype communications.

The specialists of the Ministry of Communications are completing preparations for the transmission of strips of central newspapers through space by phototelegraph to remote cities of the Soviet Union, especially Khabarovsk. This will mean a virtually simultaneous issuance of papers both in Moscow and many thousands of kilometers from the capital.

During the past decade an entire family of communication satellites has appeared. In addition to the "Molniya-1," its sisters "Molniya-2" and "Molniya-3" are circling over the planet; these constitute the main international communication system "Intersputnik." This radio-television bridge has been thrown from the shores of Cuba to the steppes of Mongolia.

Our "Raduga" communications satellite has "hovered" in the equatorial plane over the meridian seemingly dividing Siberia in half. A circular, so-called geostationary orbit, with an altitude of about 36,000 km, enables it to be fixed relative to one and the same point on the earth's surface. This means that it is possible to simplify and reduce cost of antenna construction.

Together with the "Molniyas," the "Raduga" satellite has made it possible from the beginning of the present year to change over to the relaying, in full volume, of the programs of Central Television through three major zones: extreme northeastern part of the country, including Chukotka and Kamchatka, then the Far East and Eastern Siberia, and a zone extending from the Ob' to the western boundaries of the country. Tens of millions of people can now receive television broadcasts from Ostankino at the time of day most convenient for them.

The new "Ekran" system has become a supplement to this system. It also uses a geostationary TV broadcasting satellite. Its powerful relay system for color and black-and-white programs makes it possible to carry out reception with relatively simple equipment situated at small urban and rural communication centers not entering into the effective zone of the "Orbita" stations.

As reported by the Ministry of Communications, the "Ekran" is intended for servicing poorly populated regions in Trans-Uralia, Central Siberia and the Far North, in other words, 40% of the territory of the country! By means of this satellite the holiday festivities on May Day could be seen on the television sets first lighting up in the small villages occupied by the builders of the Baykal-Amur line. In the next two or three years the number of receiving sets in the "Ekran" system will reach the thousands. Then the total number of viewers will exceed 82% of the total population of the country.

It is yet far off to the day when the call letters of the Moscow Olympic Games of 1980 are heard, but the construction of studios and apparatus to be used in presenting this spectacle is already in full sway. The radio and television audience of the world holiday of youth, strength and beauty is enormous -- Moscow, its sports arenas, halls, and tracks will be seen and heard over the entire planet.

At Ostankino work has begun on the construction of the Olympic stadium and on the international athletic center. Eighteen to twenty television programs and 100 radio broadcasts will be transmitted from there each day during the 1980 Olympics via ground communication channels and via satellite.

The international "Intersputnik" system and other facilities for radiotelevision communication will have to operate at this time with a heavy load.

[79]

CENTRAL TELEVISION BROADCASTS IN REMOTE AREA OF KAZAKHSTAN

Moscow IZVESTIYA in Russian 3 June 77 p 2

[Article by V. Korsunskiy: "'Ekran' is Transmitting"]

[Text] Alekseyevka (Vostochno-Kazakhstanskaya Oblast). Television screens are operating in the most distant regional center of the oblast. Direct reception of Central Television broadcasts in color has become possible in a settlement which is located 4,600 km away via the "Ekran" communications satellite. [5].

TASS ANNOUNCES LAUNCHING OF "KOSMOS-915"

Moscow PRAVDA in Russian 9 June 77 p 2

[TASS Report: "'Kosmos-915' Satellite"]

[Text] The artificial earth satellite "Kosmos-915" was launched in the Soviet Union on 8 June 1977. The satellite carries scientific equipment intended for the continuation of space research. The satellite was inserted into an orbit with the following parameters:

- initial period, 89.1 minutes;
- apogee, 306 kilometers;
- perigee, 182 kilometers;
- orbital inclination, 62.8 degrees.

In addition to the scientific equipment the satellite carries a radio system for the precise measurement of orbital elements and a radiotelemetry system for transmitting data on the operation of instruments and scientific equipment to earth.

The apparatus installed on the satellite is functioning normally. The coordination-computation center is processing the incoming information. [5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-916"

Moscow PRAVDA in Russian 11 June 1977 p 2

[TASS Report: "'Kosmos-916'"]

[Abstract] The artificial earth satellite "Kosmos-916" was launched in the Soviet Union of 10 June 1977. The satellite was inserted into an orbit with the following parameters:

- initial period, 89.9 minutes;
- apogee, 307 kilometers;
- perigee, 250 kilometers;
- orbital inclination, 62.8 degrees.

TASS ANNOUNCES LAUNCHING OF "SNEG-3"

Moscow PRAVDA in Russian 18 Jun 77 p 6

[TASS Report: "'Sneg-3' Over the Planet"]

[Text] In accordance with the program of cooperation between the USSR and France in the study and use of space for peaceful purposes, on 17 June 1977 the "Sneg-3" French scientific satellite was launched in the Soviet Union using a Soviet booster rocket.

The "Sneg-3" satellite is intended for performing investigations in the area of x-ray and gamma astronomy and also in the area of the sun's UV radiation.

The satellite was launched into an orbit which is close to the calculated orbit.

Launch preparation was performed by French specialists with the participation of Soviet specialists.

Flight control of the satellite and the reception of information from it are being carried out at the National Center for Space Studies in France.

According to a report from the Center, the satellite's on-board systems are operating normally. Scientific information from the "Sneg-3" will be processed and studied by scientists and specialists of the USSR and France jointly. [5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-917"

Moscow PRAVDA 17 Jun 77 p 3

[TASS Report: "'Kosmos-917'"]

[Abstract] The artificial earth satellite "Kosmos-917" was launched in the Soviet Union on 16 June 1977. The satellite was inserted into an orbit with the following parameters:

- initial period, 12 hours 5 minutes;
- apogee, 40,150 km;

- perigee, 625 km;
- orbital inclination, 62.9 degrees.

NEW ORBITA-2 STATION IN KHOROG

Moscow IZVESTIYA in Russian 14 Jun 77 p 1

[Article by V. Surkov: "Tractor Trailer Unit Above the Clouds"]

[Excerpt] Khorog. A column of trucks has arrived here. The trucks have travelled more than 2,000 kilometers over roads in Uzbekistan, Kirghizia and Tadzhikistan in order to bring unique equipment for the construction of an Orbita-2 station to Khorog.

The massive Pamir mountains, which have the highest peaks in the USSR, to this time have not hindered reception of television broadcasts. At the present time the people of the Pamirs have begun to watch regular Central Television broadcasts through the Orbita-2 system. [5]

LAUNCHING OF "KOSMOS-918" AND COMPLETION OF MISSION

Moscow PRAVDA in Russian 18 Jun 77 p 2

[TASS Report, "'Kosmos-918'"]

[Abstract] The artificial earth satellite "Kosmos-918" was launched in the Soviet Union on 17 June 1977. The satellite was inserted into an orbit with the following parameters:

- initial period, 88.4 minutes;
- apogee, 265 kilometers;
- perigee, 131 kilometers;
- orbital inclination, 65.1 degrees.

The scientific research specified by the program has been carried out.
[5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-919"

Moscow PRAVDA in Russian 19 Jun 77 p 2

[TASS Report, "'Kosmos-919'"]

[Abstract] The artificial earth satellite "Kosmos-919" was launched in the Soviet Union on 18 June 1977. The satellite was inserted into an orbit with the following parameters:

- initial period, 95.6 minutes;
- apogee, 847 kilometers;
- perigee, 278 kilometers;
- orbital inclination, 71 degrees. [5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-913" AND "KOSMOS-914"

Moscow PRAVDA in Russian 1 Jun 77 p 2

[TASS Report: "Two Satellites"]

[Text] The artificial earth satellite "Kosmos-913" was launched in the Soviet Union on 31 May 1977. The satellite carries scientific equipment intended for the continuation of space research. The satellite was inserted into an orbit with the following parameters:

- initial period, 94.5 minutes;
- apogee, 523 kilometers;
- perigee, 475 kilometers;
- orbital inclination, 74 degrees.

In addition to the scientific equipment the satellite carries a radio system for the precise measurement of orbital elements and a radiotelemetry system for transmitting data on the operation of instruments and scientific equipment to earth.

[Text] The artificial earth satellite "Kosmos-914" was launched in the Soviet Union on 31 May 1977. The satellite carries scientific equipment intended for the continuation of space research. The satellite was inserted into an orbit with the following parameters:

- initial period, 89.6 minutes;
- apogee, 327 kilometers;
- perigee, 210 kilometers;
- orbital inclination, 65 degrees.

In addition to the scientific equipment the satellite carries a radio transmitter operating on a frequency of 19.995 MHz, a radio system for the precise measurement of orbital elements and a radiotelemetry system for transmitting data on the operation of instruments and scientific equipment to earth.

The apparatus installed on the satellites is functioning normally. The coordination-computation center is processing the incoming information.

Abstracts of Scientific Articles

INVESTIGATION OF "EARTH-MOON" TRAJECTORIES

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 4, 1977 pp 189-192

[Article by A. A. Shirayev, Institute of Theoretical Astronomy, "Evaluation of the Possibility of Refining the Geocentric and Selenocentric Gravitational Constants from Trajectory Measurements of a Lunar Space Probe"]

[Abstract] An investigation of "Earth-Moon" trajectories was carried out for the purpose of determining the conditions most favorable for the refinement of the geocentric and selenocentric gravitational constants on the basis of measurements of slant range ρ and radial velocity $\dot{\rho}$ of a space probe. The author examined three classes of elliptical trajectories, differing from one another: A. Trajectories with impact on the moon. B. Trajectories for a direct hyperbolic fly-by of the moon; as a result of fly-by of the moon the probe either abandons the "earth-moon" system or passes into an orbit with an apogee radius greater than for the initial orbit. C. Trajectories with a retrograde fly-by of the moon (the probe moves around the moon and returns to the earth). On the basis of the equations of motion of the probe, in which the earth's asphericity is taken into account, as well as the attraction of the probe by the moon and sun, it was possible to derive 24 variational equations for determining the partial derivatives of the coordinates and the velocity components of the probe using eight correctable parameters, including the geocentric and selenocentric gravitational constants, the coordinates and velocity components of the probe at the initial time. The GE and GM constants can now be considered known with mean square errors equal to 1 and 0.1 km³/sec² respectively. A series of conclusions is drawn.

[72]

INFLUENCE OF ATMOSPHERE ON ALBEDO IN AEROSPACE SURVEY OF EARTH

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 5, 1977 pp 471-487

[Article by K. Ya. Kondrat'yev, A. A. Buznikov, O. B. Vasil'yev and O. I. Smoktiy, Leningrad State University and Leningrad Hydrometeorological Institute, "Influence of the Atmosphere on Albedo in an Aerospace Survey of the Earth in the Visible Region of the Spectrum"]

[Abstract] A study of the environment from aircraft and especially from spacecraft requires a knowledge of the transfer characteristics of the earth's atmosphere for different investigated optical parameters, including for spectral albedo. Theoretical computations of the spectral transfer functions for albedo were made for the Elterman model of the atmosphere (1968), a purely molecular atmosphere without ozone and with ozone. An experimental determination of such characteristics was carried out in 1970 aboard LI-2 and IL-18 aircraft at different levels in the atmosphere in the wavelength range $\lambda = 0.45-0.85 \mu\text{m}$. Comparison of the theoretically computed and experimentally determined parameters of the atmospheric transfer function for spectral albedo indicates their good agreement with one another.
[106]

SPECTRAL TRANSMISSION FUNCTION OF CARBON DIOXIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 5, 1977 pp 488-498

[Article by N. I. Moskalenko and O. V. Zotov, "New Experimental Investigations and Refinement of the Spectral Transmission Function of Carbon Dioxide"]

[Abstract] The authors examine the results of experimental investigations of the characteristics of the fine structure of the absorption spectrum of gaseous CO₂ and their promising use in problems of atmospheric optics. Also given is information on the half-width, intensity and contour of the spectral lines of CO₂ under conditions of self-broadening and broadening of CO₂ by nitrogen. The article gives the vibrational and rotational molecular constants of CO₂ and the empirical parameters of the F-factor of vibrational-rotational interaction for a series of CO₂ absorption bands. The results of comparisons of the spectral transmission functions obtained by the direct computation method and experimental data are discussed.
[106]

DETERMINATION OF SATELLITE ORBIT FROM PHOTOGRAPHIC AND LASER OBSERVATIONS

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 5, 1977 pp 235-238

[Article by O. P. Bykov and A. A. Kiselev, Astronomical Observatory Leningrad State University and Main Astronomical Observatory USSR Academy of Sciences, "Determination of Satellite Orbit from Joint Photographic and Laser Observations from One Station"]

[Abstract] In earlier studies (1973, 1976) the authors derived a system of three vector equations making it possible on the basis of apparent motion parameters to ascertain the circular or elliptical orbit of a satellite. This system of equations is fundamental for the apparent motion parameters method. In this new paper the authors examine application of this method in the case of joint photographic and laser observations made at a single station. It is shown that under these conditions for determining a reliable orbit it is sufficient to have observations of short arcs of the apparent trajectory of such a satellite (about $2-3^\circ$). The article gives an example of determination of the initial orbit of the satellite GEOS-A on the basis of photographic (six positions) and laser (10 soundings) observations carried out at Uzhgorod. The method described makes effective use of the high accuracy of laser observations and the excess information obtained by the processing of series of photographic positions of a satellite. The osculating orbit obtained in this way can serve as a basis for subsequent improvement and also for checking observation errors, especially in synchronous sessions.

[100]

FIRST RESULTS FROM "VERTIKAL'-4" EXPERIMENT

Moscow PRIRODA in Russian No 5, 1977 pp 122-123

[Article by L. A. Vedeshin]

[Abstract] In October 1976 specialists carried out still another important experiment under the "Interkosmos" program with the participation of scientists from Bulgaria, GDR, USSR and Czechoslovakia. The "Vertikal'-4" geophysical rocket was used in carrying out complex investigations of the parameters of the earth's upper atmosphere and ionosphere, as well as the absorption of solar short-wave radiation. In contrast to earlier experiments with rockets of the "Vertikal'" series, carried out to altitudes of 500 km, the latest rocket reached an altitude of 1,512 km. In the course of a short time interval (30 minutes) it was possible to measure (at different altitudes) the distribution of the concentration and temperature of electrons and positive ions and determine the change in gas composition with transition from the atmosphere to the troposphere. For example, it was established

that the temperature of the lightest component of cosmic plasma, electron gas, at altitudes from 100 to 1,500 km changed smoothly from 600 to 4,000°K. Soviet and Czech specialists investigated the composition of neutral particles. The collected data apply for the most part to the altitude range 170-400 km on the ascending branch and 400-130 km on the descending branch. Particularly interesting was determination of the concentration of neutral atoms of nitrogen and oxygen in the ionosphere. Using photometers and analyzers of photoelectrons, Soviet and East German specialists measured the intensity of solar radiation in the Lyman-alpha line and in the Schumann-Runge continuum and also in the wavelength range 600-1300 Å. The results of measurement of absorption of solar radiation at these altitudes were used in determining the profile of concentration and temperature of molecular and atomic oxygen and molecular nitrogen. Soviet specialists carried out complex investigations of the ionosphere using radio waves. This method was extremely reliable for measuring the electron concentration. It was possible to construct a profile of electron concentration. It revealed that the maximum electron concentration was observed at an altitude of about 230 km and was about $3.5 \cdot 10^5 \text{ cm}^{-3}$.

[116]

VI. MISCELLANEOUS

News

REPORT ON ACTIVITY AT MOLODEZHNYAYA ANTARCTIC BASE

Moscow PRAVDA in Russian 13 Jun 77 p 4

[TASS Report: "Fervent Activity at the 'Cold Pole'"]

[Text] Antarctica is undergoing a severe winter. It is minus 70 degrees at the "cold pole" and the sun has not appeared for a long time. But this is not stopping scientists at the six stations of the 22d Soviet Antarctic expedition from conducting scientific observations. A large group of studies is being carried out at Molodezhnaya, which is the main base of the expedition. In addition to ground observations, scientists here are also gathering information on processes transpiring in the atmosphere by using aerological and rocket sounding up to altitudes of 80-100 kilometers. Satellite information is being received and analyzed regularly. [5]

GLACIOLOGICAL CONFERENCE HELD IN ARCTIC

Moscow PRAVDA in Russian 4 Jun 77 p 6

[Article by V. Bardin, "To the Secrets of the Ice Dome"]

[Text] The first seminar of glaciologists in the high latitudes of the Arctic has been held. The motto of this seminar is "Glaciers — the Wealth of the Planet" and specialists from various regions of the country participated in it.

The Island of the October Revolution in the Severnaya Zemlya Archipelago is a strange place for a seminar. This is the fourth year of operation for the polar glaciological base of the Leningrad Institute of the Arctic and Antarctic at the top of the ice dome. Earlier the scientific station operated only in summer. This year scientists have begun to perform year-round observations. Investigators are getting to know the secrets of glaciation of the archipelago. The base was designed for testing new methods for studying the ice cover.

In the Arctic and Antarctic, as is well known, the main reserves of ice on the planet are concentrated. This ice has an enormous effect on the moisture and heat conditions and on the earth's climate. The object of investigation is not easily studied. Take, for example, the drilling of the Antarctic ice cover which is being done at Vostok station. There it is necessary to drill through a four-kilometer shell and then to draw a core sample to the surface. There are so many difficulties and unseen problems!

Of course the Vavilov glacier is miniscule in comparison with Antarctica. Its diameter is only tens of kilometers and its height does not exceed 700 meters. However, the shell structure is very similar to that of Antarctica.

Approximately 40 specialists from various regions of the country participated in the seminar.

The conditions were maximally close to field conditions and made it possible to observe various research methods in action.

At the base drilling was performed using rigs of different designs and a mobile radar station was used which enabled scientists to design a method for determining the force of a glacier and the speed of its movement. A number of the most recent glaciometeorological instruments were demonstrated. The guests familiarized themselves with the possibilities of using mathematical methods for processing information using a miniature computer specially designed for field conditions. The participants of the seminar used four-wheel drive vehicles to travel around the island and to the base of the glacier where polar poppies are in bloom for a short period of time in the summer.

The prospects for further investigations were discussed at the seminar which was held in the high latitudes of the Arctic for the first time. [5]

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